

NON-PUBLIC?: N
ACCESSION #: 8912200361

LICENSEE EVENT REPORT (LER)

FACILITY NAME: JAMES A. FITZPATRICK NUCLEAR POWER PLANT PAGE: 1
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DOCKET NUMBER: 05000333

TITLE: High Neutron Flux Scram While in Hot Standby Caused by Procedural
Inadequacy for Testing Safety Relief Valves
EVENT DATE: 11/12/89 LER #: 89-023-00 REPORT DATE: 12/12/89

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 010

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Hamilton C. Fish TELEPHONE: 315-349-6013

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

EIIS Codes are in !

At 5:34 P.M. on November 12, 1989, a reactor scram occurred during a scheduled surveillance test of safety relief valves (SRV) AD!. In preparation for the test, indicated reactor power was at approximately 10% and pressure was being controlled at 575 psig using the main steam bypass valves. The first SRV was opened in accordance with procedure. Upon closing the valve, the reactor scrammed due to a pressure transient which resulted in a high flux 15% Average Power Range Monitor (APRM) IG! trip. In the start-up/hot standby mode, the APRM trip point is set at a nominal 15%. Actual trip point settings ranged from 13.5% to 14.5% to allow for instrument drift. This left a margin of only 3.5% between indicated reactor power of 10% and the trip point. The small pressure

transient caused by opening and then closing the valve was sufficient to cause a neutron flux spike and scram the reactor. The surveillance test procedure did not provide instruction concerning an appropriate margin, nor did it provide a caution to the operator concerning the possible pressure transient and the need for an adequate margin. Corrective action revised the procedure to provide for valve testing at 940 psig when the reactor mode switch will be in the RUN mode. In the RUN mode, the flow biased scram will be in effect. The APRM high flux trip point of 120% will be in service. These safety system trip points provide adequate margin for the expected pressure transient resulting from cycling of safety relief valves.

END OF ABSTRACT

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Description

At 5:34 P.M. on November 12, 1989, a high flux reactor scram occurred. At the time, the plant was in start-up/hot standby condition at an indicated power of approximately 10%. A normal plant heat-up was in progress. Reactor water level was being maintained with the condensate booster pumps SD! discharging feedwater to the reactor vessel through the low flow control valve which was in automatic. Reactor pressure was being controlled at approximately 575 psig by the main steam bypass valves SB! through use of the electro-hydraulic control (EHC) JJ! system. One bypass valve was fully open. A second valve was approximately 65% open. The other two were closed. Pressure was being maintained at this level as a prerequisite for performance of Surveillance Test ST-22B, "Manual Safety Relief Valve Operational and Valve Monitoring System Functional Test (IST)". This test was being performed as a post-work test following replacement of two safety relief valve (SRV) topworks (LER-89-020).

Prerequisites for the safety relief valve (SRV) AD! exercise were completed. The control switch for SRV E was rotated to the open position. Position lights changed indicating the valve was open, the acoustic monitor computer point alarmed, and the intermediate range monitor readings on the nuclear instrumentation decreased. The partially open bypass valve went fully closed. The fully open steam bypass valve changed position to approximately 35% open. All of these actions are normal and expected for the opening of a safety relief valve.

Following this observation of the expected response, the control switch

for the SRV E was returned to the auto position which closes the valve. Position lamps changed indicating that it closed. The one partially open steam bypass valve increased its open position to approximately 50%. Neutron flux peaked to 14.4% causing a reactor scram on a trip signal (15%) from the Average Power Range Monitors (APRM) IG!.

As a result of the transient, reactor water level decreased from approximately 201 inches above Top of Active Fuel (TAF) down to 175 inches above TAF. Passing the low reactor water level trip point of 177 inches above TAF resulted in a second scram signal and an automatic Group II isolation. This resulted in isolation of the reactor water clean-up system CE!, and initiation of the standby gas treatment systems BH!. Reactor water level was restored to normal using the feedwater low flow control valve in manual and condensate booster pumps.

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After scram completion, operators verified that all rods were inserted. The reactor water cleanup and reactor building ventilation systems (isolated as part of Group II) were restored to service. A normal plant cooldown was initiated. Following post scram analysis and prestart-up testing, the reactor was brought critical on November 13 and connected to the grid on November 14.

Cause

The scram signal originated from the high neutron flux signal from the 15% trip level of the Average Power Range Monitors. The cause of the high flux was the void collapse in the core moderator which resulted from a steam pressure transient in the reactor vessel. This pressure transient was caused by opening the SRV E for testing (resulting in a momentary drop in reactor pressure) followed by closing of the SRV (resulting in a momentary increase in reactor pressure a few seconds later).

During operation in the RUN mode, the flow biased scram and the APRM high flux trip point of 120% are limiting. During start-up conditions (which existed during this scram), the mode switch circuitry automatically inserts an APRM high flux scram at a nominal value of 15%. Because Technical Specifications require this setpoint to be less than or equal to 15%, the actual setpoint must be lower to allow for adjustments and instrument drift. Therefore, the actual scram settings of the six APRM channels at the time of the scram ranged from 13.5% to 14.5%. Prior to the start of the surveillance test, the power levels indicated by the APRMs ranged from 10% to 11%. Thus, the margin between the indicated power level and the actual scram setpoint was about 3.5%. This margin

was not sufficient to accommodate the normal pressure transient (and resulting flux transient) that results from cycling of a safety relief valve.

Originally, when the requirements to cycle SRVs were introduced, they were tested at pressures in the area of 150 pounds of reactor pressure, and correspondingly lower power levels. At that pressure, sufficient margin existed to accommodate the pressure transient without reaching the 15% scram setpoint of the APRM trip.

Several years ago the test pressure was increased to about 575 psig in response to SRV operation improvements recommended by the NSSS supplier. This new test pressure required a higher reactor power level and thus a reduced margin to the nominal 15% scram level with the mode switch in the start-up/hot standby position. However, when the approved surveillance test procedure was revised to include the new test pressure, provisions were not made to provide a caution to the operators concerning the reduced margin to scram. Further, the procedure failed to make provisions for adequate margin because it did not identify appropriate power levels for the test. This procedure inadequacy is Cause Code D.

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There is an element of human error (cause Code A) in this event in that the operators did not anticipate the magnitude of the pressure and flux transient relative to the margin to the scram setpoint. However, in addition to the procedure failing to discuss or supply a caution for this expected pressure and flux transient, it is important to note that this test is performed only once per operating cycle or as post-work testing following maintenance or replacement of SRVs. Given the infrequent performance of this test, there is a high probability that, on any given occasion, even senior and experienced operators may be performing the test for the first time.

This test was performed at 575 psig during start-up from the planned maintenance outage in October 1989. However, at that time, the APRM monitors were set to lower power levels and thus provided a greater margin to scram. Because there is no provision for adjusting APRM levels when the reactor is operating at less than 25% power, the margin to scram will be different during each start-up.

Analysis

As an automatic scram, this event is reportable under the provisions of 10 CFR 50.73(a)(2)(iv) which requires reporting of any event or condition

that resulted in a manual or automatic actuation of any Engineered Safety Feature. The chain of events is provided in the description section of this report.

All systems performed in accordance with the assumptions of the Final Safety Analyses Report. The event was self-terminating in that even if the 15% scram setpoint had not been activated, the perturbation in pressure was sufficiently small that the moderator and fuel reactivity coefficients could reasonably be assumed to have returned the power to a stable value for the given rod position with the bypass valves continuing to open to control pressure. Accordingly, there were no safety consequences resulting from this transient.

Corrective Action

A Temporary Change was made to Surveillance Test ST-22B on November 13, followed by a permanent revision to the procedure on November 16, 1989. A paragraph was inserted under the "Test Frequency" section stating that the test will be completed within 12 hours of obtaining 940 psig reactor vessel pressure when being performed to demonstrate operability of the SRVs. This is in agreement with the standard Technical Specifications for BWR reactors. Testing at this pressure will mean that the mode switch will be in the RUN position. As a result, the 15% APRM scram will be bypassed and the flow biased and 120% high flux scram setpoints will provide sufficient margin for the anticipated pressure/flux transient.

ATTACHMENT 1 TO 8912200361 PAGE 1 OF 1

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December 12, 1989
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United States Nuclear Regulatory Commission
Document Control Desk
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Washington, D.C. 20555

REFERENCE: DOCKET NO. 50-333

LICENSEE EVENT REPORT: 89-023-00
Reactor Scram High Flux
During SRV Testing

Dear Sir:

This Licensee Event Report is submitted in accordance with 10 CFR
50.73(a)(2)(iv).

Questions concerning this report may be addressed to Mr. Hamilton Fish at
(315) 349-6013.

Very truly yours,

WILLIAM FERNANDEZ

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Enclosure

cc: USNRC, Region I
USNRC Resident Inspector
INPO Records Center
American Nuclear Insurer

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